

Objectives

An esophagectomy, which is removal of all or part of the esophagus, is considered a complex surgical procedure.(1) While historically done via open surgery, there has been a shift in the last decade towards minimally invasive esophagectomy (MIE) to reduce the significant morbidity associated with the procedure (2,3). The objective of this study was to compare the most recent NSQIP data on open esophagectomies versus MIE to assess survival and complication rates for both groups.

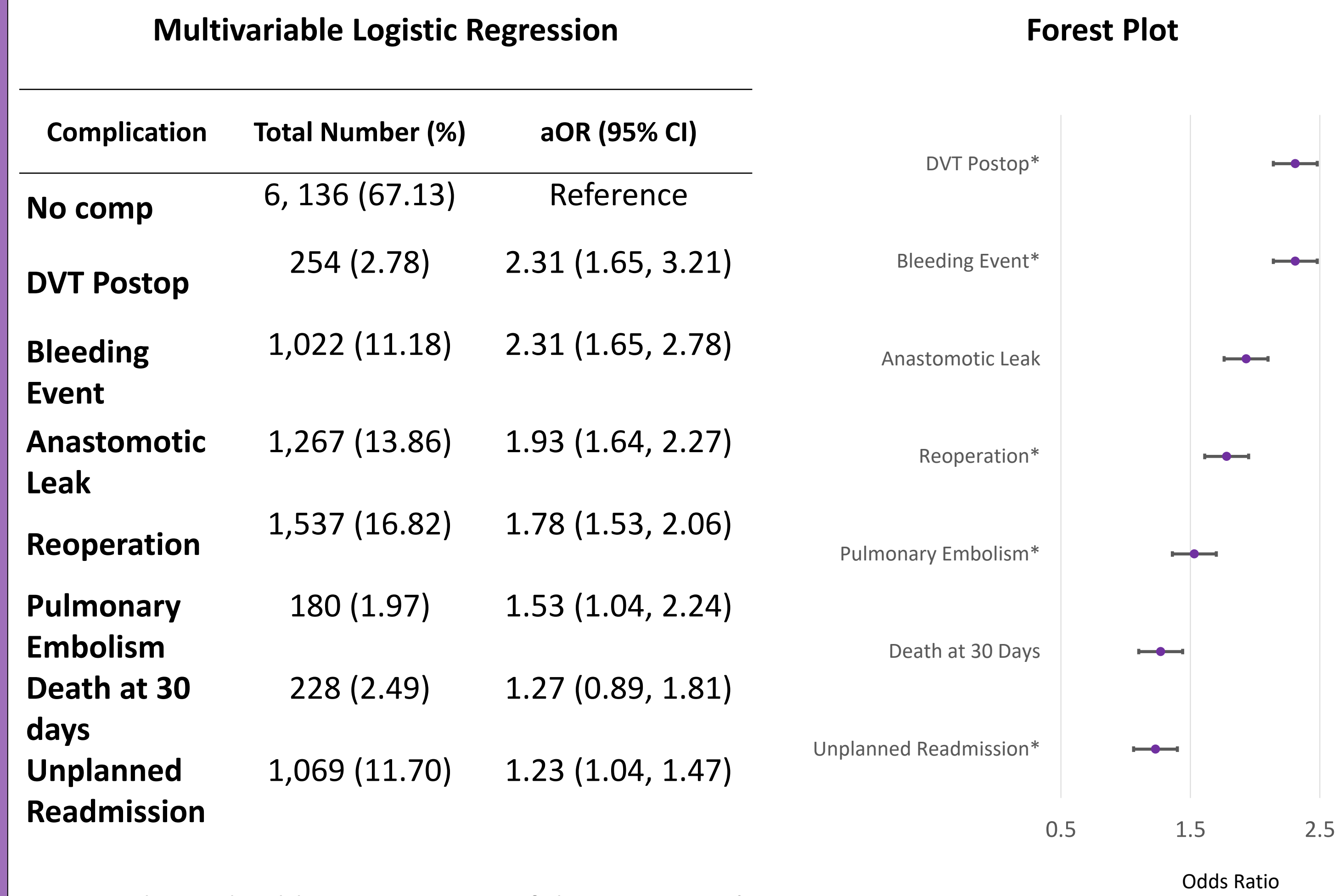
Methods

A retrospective cohort analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) Esophagectomy Procedure Targeted Data File was conducted (CITE). All patients aged 18-90 who underwent an esophagectomy at NSQIP reporting hospitals between 2016 to 2020 were included in the study. **Primary Outcome:** Death at 30 days. **Secondary Outcomes:** Length of operation, presence of one of the following complications: anastomotic leak, postoperative bleeding, surgical site infections, return to OR, and unplanned readmissions. **Multivariable logistic and linear regressions** were performed with results significant at the **0.05 level** reported.

Results

A total of 12,769 esophagectomies were performed at NSQIP participating hospitals between 2016-2020. After exclusion of 3629 patients for missing surgical approach data or missing outcome data, a total of 9,140 patients were included for analysis. The total number of MIE was 5644, the total number of open esophagectomies was 3496. The rate of MIE increased overall between 2016-2020, whereas the rate of open procedures was stable. In an adjusted multivariable logistic regression, patients who underwent open procedures had a **100% increase in odds of death at 30 days** (OR 2.08 [1.18,3.64]). Patients who underwent open esophagectomies had a **128% increased odds of bleeding complications**. In an adjusted multivariable linear regression, operative time was increased on average by 88 minutes for MIE compared to open procedures. There was no statistically significant difference in risk of anastomotic leak requiring intervention between the two groups. Compared to non-Hispanic white patients, non-Hispanic Black patients at 150% increased odds of bleeding complications, but 15% decreased odds of death at 30 days. Women had higher odds of both death at 30 days and bleeding complications compared to men in this cohort.

Figure 1: Forest Plot Evaluating the Association of Operative Time >8 hours and postoperative complications following esophagectomies.



aOR = adjusted Odds Ratio; CI = Confidence Interval

* p < 0.05

Table 1: Association of Operative Time and Approach with Post Operative Complication or Death at 30 days

Parameter	Total 9,140 (100%) N	No Complication (%)	Complication or Death at 30 days (%)	aOR (95% CI)
Operative time/Approach				
Short/OE	1,735	69.80	30.20	Reference
Short/MIE	1,358	76.14	23.86	0.71 (0.59, 0.84)
Medium/OE	1,074	62.38	37.62	1.39 (1.18, 1.65)
Medium/MIE	1,745	69.68	30.32	1.03 (0.88, 1.19)
Long/OE	688	51.38	48.62	2.19 (1.82, 2.65)
Long/MIE	2,540	65.00	35.00	1.38 (1.21, 1.59)

aOR = adjusted Odds Ratio; CI = Confidence Interval; MIE= minimally invasive esophagectomy; OE= open esophagectomy; Short = less than 6 hours, Medium=6-9 hrs, Long= greater than 9 hrs

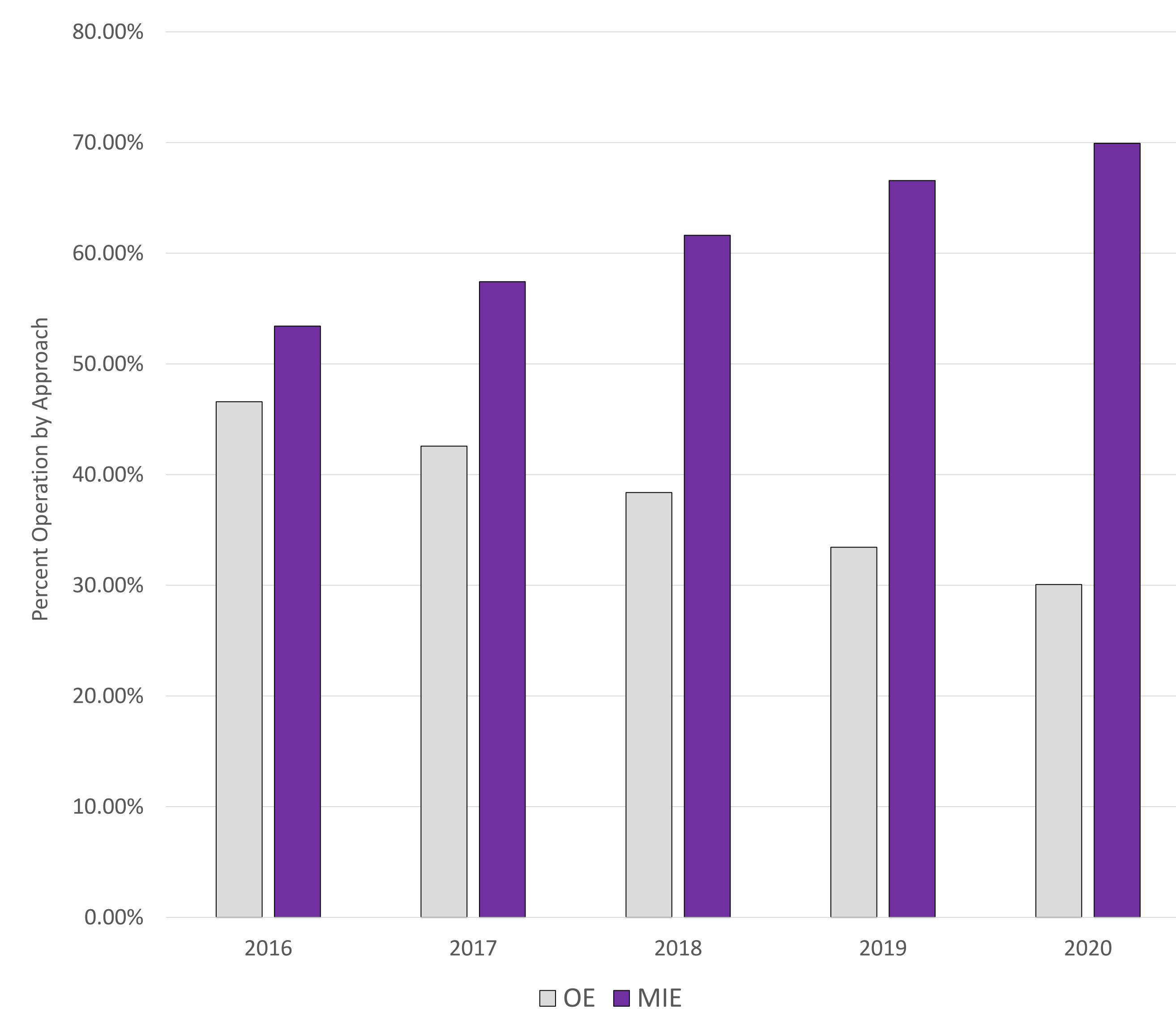
Table 3: Linear Regression Evaluating Patient Characteristics Contributing to Prolonged Operative Time

Parameter	Operative Minutes	95% CI
Open Esophagectomy	Ref	Ref
MIE	79.74	74.28, 85.24
Male	Ref	Ref
Female	-13.98	-20.81, -7.16
NHW	Ref	Ref
NHB	-10.11	-24.74, 4.52
Hispanic	32.15	10.11, 54.20
Asian	-18.82	-34.20, -3.45
AN/AI/PI/NH	33.48	-7.93, 74.89
No diagnosis of diabetes	Ref	Ref
+Diabetes	2.74	-1.18, 6.67
No diagnosis of COPD	Ref	Ref
+COPD	11.19	1.00, 13.96
BMI <= 25	Ref	Ref
BMI 25-30	20.22	14.52, 25.91
BMI >30	69.31	5.05, 133.56

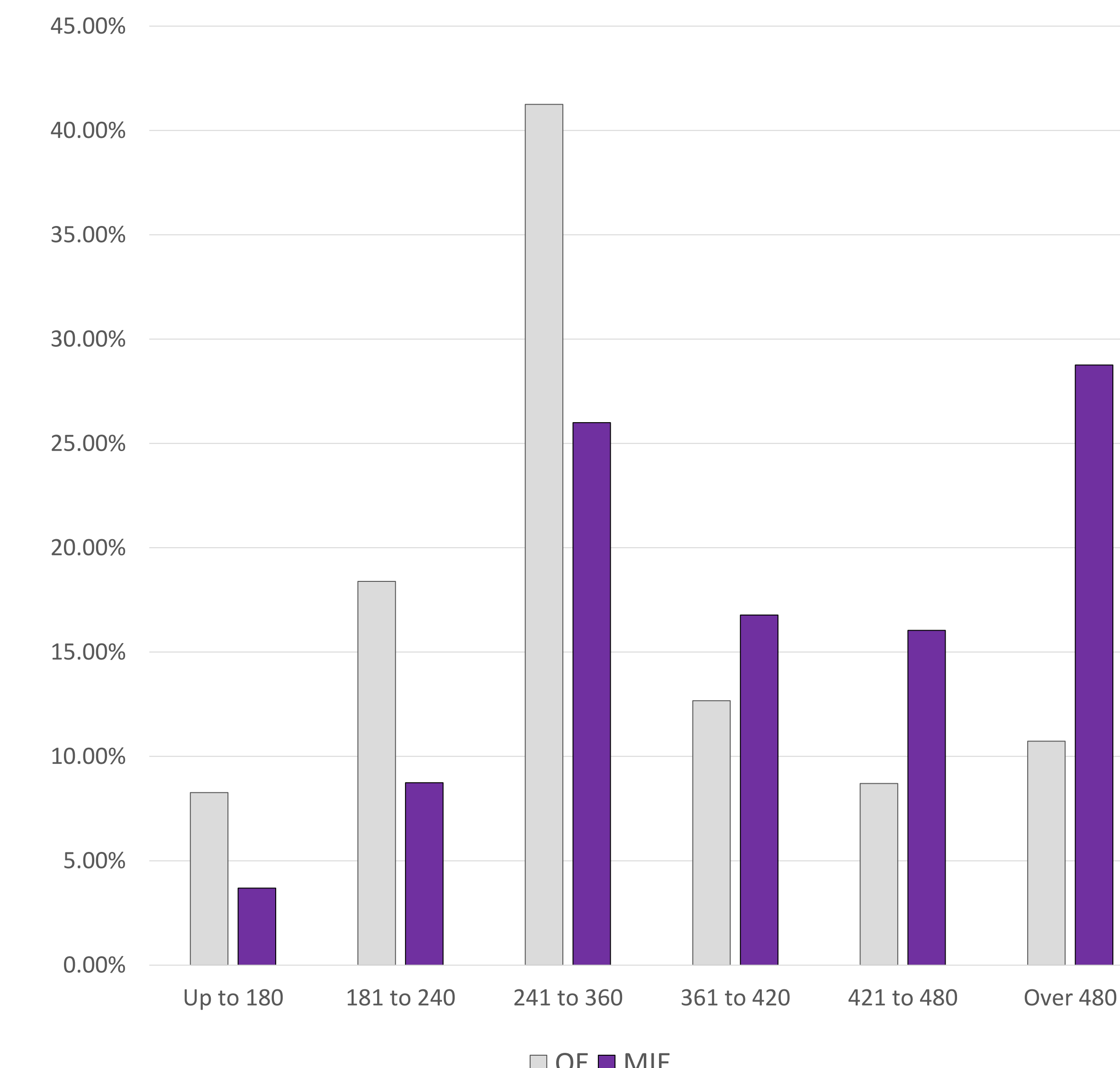
CI= Confidence Interval, NHW= Non-Hispanic White, NHB=Non-Hispanic Black, AN/AI/PI/NH=Alaskan Native, American Indian, Pacific Islander, Native Hawaiian

Figures 2 & 3

2. Percent Operative Approach by Year



3. Length of Operative Time by Operative Approach



Conclusions

Our study further highlights the decreased morbidity and mortality associated with MIE compared to open procedures. However, as operative time increases, the differences in morbidity and mortality between open and MI esophagectomies decreases. This further highlights that this remains an intricate procedure which requires significant expertise regardless of operative approach. Ensuring hospitals have appropriate resources to support performance of these complex procedures will improve patient care and outcomes.

References

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